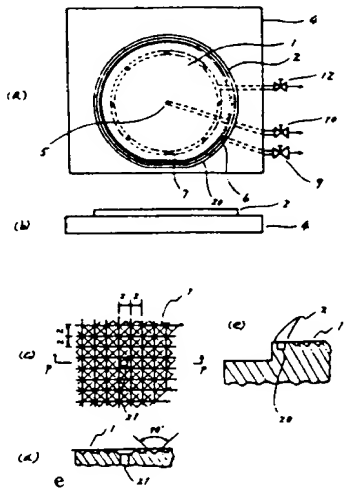
(54) VACUUM SUCTION ANCHOR BLOCK
(11) 1-129438 (A) (43) 22.5.1989 (19) JP
(21) Appl. No. 62-287335 (22) 16.11.1987
(71) HITACHI LTD(1) (72) YOSHIO KAWAMURA(4)
(51) Int. Cl⁴. H01L21/68



e: section P-P

PURPOSE: To suck and fix a wafer in a state which the flatness of the wafer is held extremely high accuracy by forming the array pitches of projections contacting and supporting the rear of the wafer to a matrix shape and shaping a groove capable of evacuated apart from a region, in which there are projection sections, to the outer circumferential section of the wafer.

CONSTITUTION: A plurality of projection sections 1 are formed in a region included by an outer circumferential section 2 in a suction base 4. The projection section 1 is formed to a pyramidal shape that longitudinal and lateral pitches are brought to 2mm and the crossing angle of cross sections forms 90°. A vacuum hole 5 is shaped at the center of a region in which there are a plurality of the projection sections, and there are eight suction force near the outer circumferential section. The vacuum hole 5 is connected to an exhaust system through a throttle valve 10 and a vacuum hole 7 through a throttle valve 12. The outer circumferential section 2 is formed to a plane shape along the contour of a wafer sucked and fixed. The outer circumferential section 2 has a groove section 20 and is connected to the exhaust system through a vacuum hole 6 and a throttle valve 9. The outer circumferential section 2 is 3mm wide, and the groove 20 in 1.5mm width and 2mm depth is formed at the center thereof.

(54) MANUFACTURE OF SEMICONDUCTOR DEVICE
(11) 1-129439 (A) (43) 22.5.1989 (19) JP
(21) Appl. No. 62-289954 (22) 16.11.1987
(71) MITSUBISHI ELECTRIC CORP (72) KAKUTAROU SUDA
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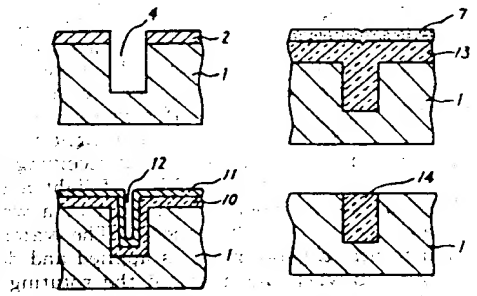
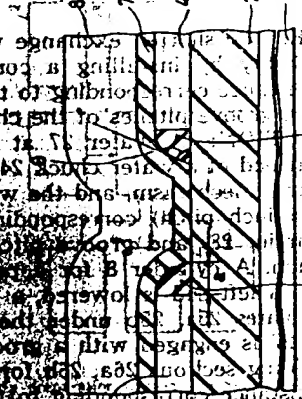


PURPOSE: To form excellent trench isolation structure, and to improve performance by applying a crystalline layer or an amorphous layer onto the whole surface of the inwall of a trench, oxidizing said crystalline layer or amorphous layer through thermal oxidation, changing the layer into an oxide layer and burying said trench so as to cross and cover one main surface of a substrate.

CONSTITUTION: A trench 4 is formed in a substrate 1 through a conventional process. A mask layer 2 on one main surface of the substrate 1 is removed, and an oxidation-resistant layer 10 such as an silicon oxide film is applied onto the whole surface in specified film thickness through a CVD method, etc. A polycrystalline silicon layer 11 is applied onto the whole surface on the layer 10 in predetermined film thickness through the CVD method, etc. The polycrystalline silicon layer 11 is oxidized through thermal oxidation, thus changing the layer 11 into an oxide layer 13 unified with the oxidation-resistant layer 10, then burying the inside of the trench 4. The upper section of the oxide layer 13 is spin-coated with a resist 7 for flattening, reactive ions having approximately the same etching rate as the resist are selected, and the resist 7 for flattening and the oxide layer 13 are removed continuously through etch-back through an RIE method, etc. One main surface of the substrate 1 is brought to an exposed state, thus leaving the oxide layer 13 in the trench 4.

(54) SEMICONDUCTOR DEVICE
(11) 1-129440 (A) (43) 22.5.1989 (19) JP
(21) Appl. No. 62-286461 (22) 14.11.1987
(71) FUJITSU LTD (72) YASUMI EMA
(51) Int. Cl⁴. H01L21/88,H01L27/10



PURPOSE: To alleviate the adverse effect of a stepped section, and to apply a normal photo-lithographic technique to a thick film formed on the stepped section by shaping a sidewall film onto a film forming the stepped section under a certain condition in the state in which the stepped section is generated in a foundation.

CONSTITUTION: Gate electrodes 4_2 and 4_3 as word lines are formed onto a field insulating film 2, sidewall films 2A as foundations shaping inclinations to stepped sections are formed onto the side surfaces of the edges, an inter-layer insulating film 7 is shaped, coating these films 2A, and a polycrystalline silicon film 8 as a storage electrode is formed onto the film 7. When the thickness of the gate electrodes 4_2, 4_3 is represented by (d) and the thickness of a base being in contact with a foundation in the sidewall film 2A by (a), a must be held at that time. Even when the inter-layer insulating film 7 in standard thickness such as 1000[Å] is shaped in order to ensure breakdown strength required for a DRAM and the considerably thick polycrystalline silicon film 8 is formed onto the film 7, the film 8 can be patterned positively and finely through a normal photo-lithographic technique.

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(73)特許権者　999999999
株式会社日立製作所
東京都千代田区神田駿河台４丁目６番地

(73)特許権者　999999999
日立東京エレクトロニクス株式会社
東京都青梅市藤橋３丁目３番地の２

(72)発明者　河村　喜雄
東京都国分寺市東恋ケ窪１丁目280番地
株式会社日立製作所中央研究所内

(72)発明者　松波　正吉
東京都青梅市藤橋３丁目３番地の２　日立東京エレクトロニクス株式会社内

(74)代理人　弁理士　小川　勝男　（外１名）

審査官　小田　裕

最終頁に続く

(54)【発明の名称】　真空吸着固定台および真空吸着固定方法

(57)【特許請求の範囲】

【請求項１】複数の突起を有する中心部と、溝を有する外周部とを備えた真空吸着固定台において、前記突起の配列ピッチは2mm以下で、かつ、前記中心部と前記外周部とはそれぞれ真空排気可能に構成されていることを特徴とする真空吸着固定台。

【請求項２】複数の突起を有し、かつ、前記突起の表面に窒化膜が形成されていることを特徴とする真空吸着固定台。

【請求項３】載置された基板を真空吸着固定する際、前記基板の表面が±0.5μm以下の平坦度となるように複数の突起を有する中心部と溝を有する外周部とを備えた真空吸着固定台上に基板を載置する工程と、
前記中心部と前記外周部とを真空排気し、前記真空吸着固定台に前記基板を固定する工程とを有することを特徴とする真空吸着固定方法。

【請求項４】前記中心部よりも前記外周部の排気速度を大きくすることを特徴とする特許請求の範囲第３項記載の真空吸着固定方法。

【請求項５】前記複数の突起の表面は、前記基板の裏面よりも硬度が高いことを特徴とする特許請求の範囲第３項又は第４項記載の真空吸着固定方法。

【請求項６】複数の突起を有し、かつ、前記突起の表面に窒化膜が形成されている真空吸着固定台上に基板を載置する工程と、
真空排気し、前記真空吸着固定台に前記基板を固定する工程とを有することを特徴とする真空吸着固定方法。

【発明の詳細な説明】

〔産業上の利用分野〕

本発明は薄板を固定する技術に係り、特に薄板を平坦

に固定するのに好適な真空吸着固定台および真空吸着固定方法に関する。

〔従来の技術〕

従来の装置は特公昭60－15147に示されるように円筒状のピンを容器の中に組立てる構造となっていた。

また、特開昭60－99538号広報には、一体の結晶物質から構成され、ピークの先端が同一平面上にある真空チャックについて開示されている。

しかし、真空吸着固定台の複数の領域を独立に排気可能に構成すること、または、真空吸着固定台の表面に窒化膜を形成することについては開示がない。

〔発明が解決しようとする問題点〕

上記従来技術は、複数個の突起の形成を組立て構造としているため、その配列間隔を狭めることが難しく、突起と突起の間のウエーハが大気圧によって変形することに対する配慮がされておらず平坦度を高精度に保つ点で問題があった。また、従来技術では、突起を包含している外周部が一つのリム構造であるため、外部から漏れて侵入する大気の影響について配慮されていないため、ウエーハ外周部の吸引力が弱くなって、吸引固定時にウエーハ周辺の平坦度が低下する問題があった。

本発明の目的は、多数の突起を用いて薄膜を支持する際の大気圧による変形と、薄板を吸引固定する際のウエーハ外周の平坦度を良好にすることにある。

〔問題点を解決するための手段〕

上記目的は、複数の突起を有する中心部と、溝を有する外周部とを備えた真空吸着固定台において、前記突起の配列ピッチは2mm以下で、かつ、前記中心部と前記外周部とはそれぞれ真空排気可能に構成されていることを特徴とする真空吸着固定台、また載置された基板を真空吸着固定する際、前記基板の表面が±0.5μm以下の平坦度となるように複数の突起を有する中心部と溝を有する外周部とを備えた真空吸着固定台上に基板を載置する工程と、前記中心部と前記外周部とを真空排気し、前記真空吸着固定台に前記基板を固定する工程とを有することを特徴とする真空吸着固定方法により達成される。

〔作用〕

突起部を一つの母材から切削等により形成することにより突起部の間隔を小さくできるので、薄いウエーハが大気圧で押されてたわみ、変形することを防止できる。また、突起部の間隔が小さくなるため流量抵抗が増し、ウエーハ外周部からの大気浸入の影響をウエーハ裏面の負圧空間の中央の領域まで伝搬することを防ぐことができる。従って、該負圧空間の外周部近傍に吸収孔を設けて、中央の吸収孔よりも排気速度を大きくすることにより、大気浸入による吸引力の低下を容易に防止可能となる。さらに外周部に連続した溝を設け、上述の負圧空間とは独立に排気することにより、ウエーハ周辺からの大気の侵入の影響を完全に除去することができる。従って、ウエーハの平坦度を極めて高精度に保持した状態で吸引固定することが可能となる。

〔実施例〕

以下、本発明の一実施例を第１図ににより説明する。aは本発明吸着台の平面図、bは側面図、cは突起部と吸引孔との拡大平面図、dは突起部と吸引孔の断面図、eは外周部の断面図であり、各々共通な部位には同一番号を付してある。

吸着台４には、外周部２に包含された領域に複数個の突起部１がある。突起部１はc,d図に示すように、縦、横のピッチが2mmで断面の交差角度が90°をなす四角錘状の形状である。突起部の先端の面積は0.0025mm²～0.01mm²である。複数の突起部のある領域の中央に吸引孔５があり、外周部近傍に８個の吸引力がある。

吸収孔５は絞り弁10を介して、また吸引孔７は、絞り弁12を介して図示していない排気系に接続している。外周部２は吸引固定するウエーハの輪郭に沿った平面形状をしている。さらに、外周部２は溝部20を有し吸引孔もと絞り弁９を介して図示していない排気系に接続している。外周部２は断面図eに示してあるように、その幅は3mmで、中央に幅1.5mm深さ2mmの溝20が形成されている。

なお、吸引孔5,7の拡大図をc,dに示してあるが、その形状はいずれも等しく、孔21の形状であり、その直径は1mmである。また突起部１と外周部２とは図b,eに示す通り同一の平面となるように平坦に加工されている。

絞り弁9,10,12はウエーハの裏面を吸引固定する際の排気速度を変え、外周部に近い所程吸引力を大きくするように吸引圧分布を生じている。絞り弁の流量抵抗は絞り弁9,12,10の順で大きくなるように設定してある。従って、大気の侵入洩れの大きいウエーハ外周部の吸引力が損なわれなくなる。

第２図は、周辺部に溝部のない従来の吸着台で４インチウエーハを吸引固定した場合のウエーハ表面の直径上を片側の周辺部を含む領域の平坦度を３次元測定機で測定した一例である。図中のスケールWは吸着台から外側の部分でウエーハの平坦度が急激に悪化している領域を示しており、この例では約8mmに及んでいる。Wの領域を除いた内側では、平坦度が±0.5μmであるのに、Wの領域を含めると５μm以上に悪化している。

第３図は本発明による外周部に溝を設けた吸着台を用いて４インチウエーハを吸引固定した場合の前図と同じ位置のウエーハ表面の平坦度の測定結果である。外周部におけるウエーハ表面の平坦度の悪化は認められず、ウエーハ全面で±0.5μmの平坦度が得られている。

本発明の別の実施例の平面図を第４図に示す。吸着台40は、前述の発明例と同一形状の四角錘状の突起部41とそれを包含する外周部42から構成される。外周部42には溝が形成され吸引孔と絞り弁44を経て図示していない排気系に接続している。複数の突起部の配列から成る領域は絞り弁43を経て図示していない排気系に接続してい

5

る。なお本例の吸着台は、ウエーハのオリエンテーションフラットを用いてウエーハの位置決めを行うための回転支持部45,46,47,48を有している。図示していない給気系に接続した駆動ピストンによって、支持部48を開閉させて、吸着台上でウエーハを機械的に位置決めすることができる。

なお、吸着台の逃げ部49は、図示していないウエーハ裏面吸引搬送アームの挿入を可能とする領域である。

以上述べた発明の吸着台の材質は耐摩耗性の良いアルミ合金A7075（日立製作所製AHS）を用いた。しかし材質としては、吸着固定するウエーハと熱膨張率が近いものが好ましく、他の材質を用いることも可能である。例えば、シリコンウエーハ用の吸着台としてはシリコン単結晶を用いて作製することが望ましい。シリコン単結晶製の吸着台の作り方としては、異方性エッチングを用いて四角錘状の突起を作り、外周部は等方性エッチングを用*

6

*いて形成することが可能である。これらのエッチング技術は半導体プロセス分野で公知である。もちろん機械加工も可能である。加工後の突起部と外周部に窒化膜形成処理を行うとウエーハ裏面よりも硬度が高くなり耐摩耗性が向上する。

次に複数の突起部分の配列ピッチについて述べる。突起部や外周部の先端で支持されて真空吸引されるウエーハ面には大気圧が負荷され、支持の存在しない所がたわみ変形する。ウエーハの変形量は、分布荷重の加わる両端支持梁として近似計算することができる。幅をb、厚さをh、長さをl、縦弾性係数をE、断面二次モーメントを

$$I = \frac{b\,h^3}{12},$$

等分布荷重をwとするとこの梁の最大たわみ量δは

$$\delta = \frac{5\,w\,\ell^4}{384\,E\,I} \quad \cdots\cdots (1)$$

となる。今幅bを突起部のピッチと仮定し、長さlを正方配列の場合の対角長$\sqrt{2}\cdot b$とし、大気圧0.01kg/mm²※（100KPa）が単位幅bに加わるもととすると、wは0.01×bとなり式（1）は

$$\delta = \frac{0.006\cdot b^4}{E\cdot h^3} \quad \cdots\cdots (2)$$

さらに4インチシリコンウエーハの場合E＝2×10⁴kg/mm、h＝0.4mmとすると、式（2）は

★ $\delta = 5\cdot 10^{-6}\cdot b^4$ ……（3）

従って$\delta \leqq 0.001$mmとするには

$$b \leqq \left(\frac{0.001}{5\times 10^{-6}}\right)^{\frac{1}{4}} = 3.8 \quad \cdots\cdots (4)$$

より、4mm以下のピッチが望ましくなる。シリコンウエーハの裏面は、ポリッシング後加工変質層を除去するためエッチング処理が施されているため、微少な凹部が多く、突起部の先端部の面積を0.0025mm²～0.01mm²とした場合でも、全ての突起部の先端がウエーハ裏面に接触するのは困難と考えられるため、実際の突起部の配列ピッチは余裕を見込んで2mm以下が望ましい。なお、この配列ピッチの距離は、ウエーハの材質や厚さやたゆみ量の許容値により当然変わるが、パターンの微細化の進む、半導体分野においては、ウエーハのたわみ量が現在より一桁小さくなることが要求されており、そのためにも、突起部のピッチは2mm以下にすることが必要である。

（（4）式においてδ≦0.0001mmとするにはb≦2mmとなる）

☆〔発明の効果〕

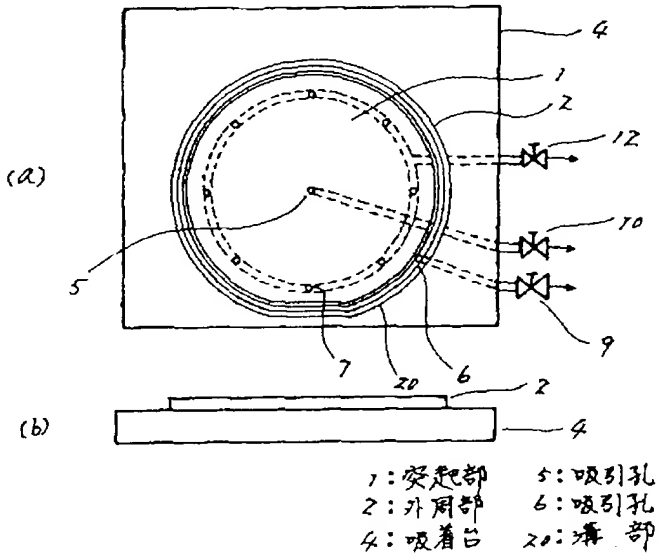
本発明によれば、ウエーハを±0.5μm以下の平坦度で吸引固定でき、しかも突起状の支持点で支るため、塵埃等の介在による平坦度の悪化も防止できるので、微細パターン形成を必要とする半導体プロセスの試料台に適用する上で効果がある。

【図面の簡単な説明】

第1図は本発明の実施例の図で、その（a）は平面図、（b）は側面図、（c）は突起部の平面拡大図、（d）及び（e）は拡大断面図、第2図は従来例による測定データを示す図、第3図は本発明による測定データを示す図、第4図は第2の実施例の平面図である。

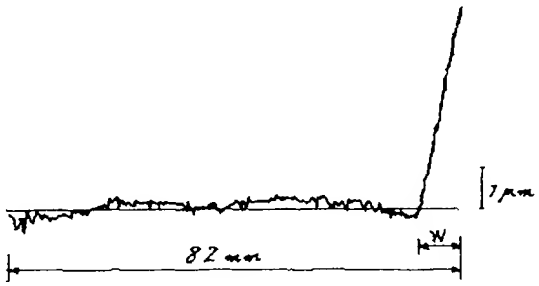
1…突起部、2…外周部、4…吸着台、5…吸引孔、6…吸引孔、20…溝部。

【第1図】

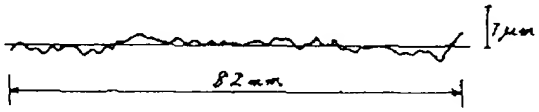


1：突起部　5：吸引孔
2：外周部　6：吸引孔
4：吸着台　20：溝　部

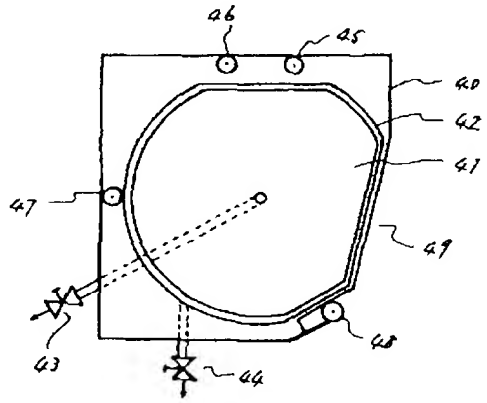
【第2図】



【第3図】



【第4図】



フロントページの続き

(72)発明者　黒崎　利栄
東京都国分寺市東恋ケ窪1丁目280番地
株式会社日立製作所中央研究所内
(72)発明者　佐藤　一雄
東京都国分寺市東恋ケ窪1丁目280番地
株式会社日立製作所中央研究所内
(72)発明者　田中　伸司
東京都国分寺市東恋ケ窪1丁目280番地
株式会社日立製作所中央研究所内

(56)参考文献　特開　昭62－221130（ＪＰ，Ａ）

1. JP,2574818,B

* NOTICES *

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CLAIMS

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(57) [Claim(s)]
[Claim 1] They are the vacuum adsorption standing ways characterized by for the array pitch of the aforementioned salient being 2mm or less, and being constituted by the aforementioned core and the aforementioned periphery section possible [evacuation] in vacuum adsorption standing ways equipped with the core which has two or more salients, and the periphery section which has a slot, respectively.
[Claim 2] Vacuum adsorption standing ways characterized by having two or more salients and forming the nitride in the front face of the aforementioned salient.
[Claim 3] The vacuum adsorption fixed method of carrying out the evacuation of the process which lays a substrate on vacuum adsorption standing ways equipped with the core which has two or more salients, and the periphery section which has a slot, and the aforementioned core and the aforementioned periphery section so that the front face of the aforementioned substrate may serve as the flatness of **0.5 micrometers or less, in case the vacuum adsorption fixation of the laid substrate carries out, and carrying out having the process which fixes the aforementioned substrate to the aforementioned vacuum adsorption standing ways as the feature.
[Claim 4] The vacuum adsorption fixed method given in the 3rd term of a patent claim characterized by making the exhaust speed of the aforementioned periphery section larger than the aforementioned core.
[Claim 5] the claim characterized by the front face of two or more aforementioned salients having a degree of hardness higher than the rear face of the aforementioned substrate -- the [the 3rd term or] -- the vacuum adsorption fixed method given in 4 terms
[Claim 6] The vacuum adsorption fixed method characterized by having the process which lays a substrate on the vacuum adsorption standing ways which have two or more salients and, by which the nitride is formed in the front face of the aforementioned salient, and the process which carries out evacuation and fixes the aforementioned substrate to the aforementioned vacuum adsorption standing ways.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[Industrial Application]
this invention relates to suitable vacuum adsorption standing ways to start the technology which fixes sheet metal, especially fix sheet metal evenly, and the vacuum adsorption fixed method.
[Description of the Prior Art]
Conventional equipment had become the structure which assembles a cylinder-like pin in a container as shown in JP,60-15147,B.
Moreover, crystal matter of one is consisted of by JP,60-99538,A public relations, and it is indicated about the vacuum chuck which has the nose of cam of a peak in a coplanar.
However, there is no indication about constituting two or more fields of vacuum adsorption standing ways independently possible [exhaust air], or forming a nitride in the front face of vacuum adsorption standing ways.
[Problem(s) to be Solved by the Invention]
Since the above-mentioned conventional technology assembled formation of two or more salients and made it structure, it had a problem at the point which it is difficult to narrow the array interval, and consideration to the wafer between salients deforming with atmospheric pressure is not carried out, but keeps flatness highly precise. Moreover, with the conventional technology, since it was not considered about the influence of the atmosphere which leaks from the exterior and invades since the periphery section which includes the salient is one rim structure, the suction force of the wafer periphery section became weak, and there was a problem to which the flatness of the wafer circumference falls at the time of suction fixation.
The purpose of this invention is to make good flatness of deformation by the atmospheric pressure at the time of supporting a thin film using much salients, and the wafer periphery at the time of carrying out suction fixation of the sheet metal.
[Means for Solving the Problem]
In vacuum adsorption standing ways equipped with the core where the above-mentioned purpose has two or more salients, and the periphery section which has a slot, the array pitch of the aforementioned salient is 2mm or less. And the vacuum adsorption standing ways characterized by being constituted by the aforementioned core and the aforementioned periphery section possible [evacuation], respectively, Moreover, the process which lays a substrate on vacuum adsorption standing ways equipped with the core which has two or more salients so that the front face of the aforementioned substrate may serve as flatness of **0.5 micrometers or less in case vacuum adsorption fixation of the laid substrate is carried out, and the periphery section which has a slot, It is attained by the vacuum adsorption fixed method which carries out evacuation of the aforementioned core and the aforementioned periphery section, and is characterized by having the process which fixes the aforementioned substrate to the aforementioned vacuum adsorption standing ways.
[Function]
Since the interval of a height can be made small by forming a height by cutting etc. from one base material, a thin wafer is pushed with atmospheric pressure, bends, and can prevent deforming. Moreover, since the interval of a height becomes small, flow rate resistance can prevent spreading the influence of air permeation from increase and the wafer periphery section to the field of the center of the negative pressure space of a wafer side. Therefore, prevention becomes possible easily about the fall of the suction force by air permeation by preparing a pore near the periphery section of this negative pressure space, and making an exhaust speed larger than a central pore. The influence of invasion of the atmosphere from the wafer circumference is completely removable by preparing the slot which furthermore followed the periphery section and exhausting independently of above-mentioned negative pressure space. Therefore, it becomes possible to carry out suction fixation of the flatness of a wafer in the state where it held very

with high precision.
[Example]
Hereafter, one example of this invention is looked like [a view 1], and is explained more. a -- the plan of this invention adsorption base, and b -- a side elevation and c -- a height and suction -- an expansion plan with a hole, and d -- a height and suction -- the cross section of a hole and e are the cross sections of the periphery section, and have given the same number to the part common to each
In the adsorption base 4, two or more heights 1 are in the field included by the periphery section 2. A height 1 is the square weight-like configuration where the degree of crossed axes angle of a cross section makes [the pitch of length and width] 90 degrees by 2mm, as shown in c and d view. The area at the nose of cam of a height is 2 0.0025mm 2-0.01mm. the center of a field with two or more heights -- suction -- there is a hole 5 and the suction force of eight pieces is near the periphery section
a pore 5 -- a throttle valve 10 -- minding -- moreover, suction -- the hole 7 is connected to the exhaust air system which is not illustrated through a throttle valve 12 The periphery section 2 is carrying out the flat-surface configuration where the profile of the wafer which carries out suction fixation was met. furthermore, the periphery section 2 -- a slot 20 -- having -- suction -- it has connected with a hole 6 at the exhaust air system which is not illustrated through a throttle valve 9 As the periphery section 2 is shown in the cross section e, the width of face is 3mm, and the with a width-of-face depth [2mm depth of 1.5mm] slot 20 is formed in the center.
in addition, suction -- although the enlarged view of holes 5 and 7 is shown in c and d, each of the configuration is equal, it is the configuration of a hole 21, and the diameter is 1mm Moreover, a height 1 and the periphery section 2 are evenly processed so that it may become the same flat surface as shown in Drawings b and e.
Throttle valves 9, 10, and 12 changed the exhaust speed at the time of carrying out suction fixation of the rear face of a wafer, and the place near the periphery section has produced the suction force distribution so that a suction force may be enlarged. Flow rate resistance of a throttle valve is set up so that it may become large in order of throttle valves 9, 12, and 10. Therefore, the suction force of the large wafer periphery section of the popular omission in an invasion is no longer spoiled.
A view 2 is an example which measured the flatness of the field which includes the diameter top on the front face of a wafer at the time of carrying out suction fixation of the 4 inch wafer on the conventional adsorption base which does not have a slot in a periphery for the periphery of one side with the 3-dimensional measurement machine. The scale W in drawing shows the field where the flatness of a wafer is getting worse rapidly in the outside portion from the adsorption base, and has amounted to about 8mm in this example. In the inside except the field of W, although flatness is **0.5 micrometers, if the field of W is included, it will get worse to 5 micrometers or more.
A view 3 is as a result of [of the flatness on the front face of a wafer of the same position as front drawing at the time of carrying out suction fixation of the 4 inch wafer using the adsorption base which established the slot in the periphery section by this invention] measurement. Aggravation of the flatness on the front face of a wafer in the periphery section is not accepted, but the flatness of **0.5 micrometers is obtained all over the wafer.
The plan of another example of this invention is shown in a view 4. The adsorption base 40 consists of a height 41 of the shape of square weight of the same configuration as the above-mentioned example of invention, and the periphery section 42 which includes it. a slot forms in the periphery section 42 -- having -- suction -- pass a hole and a throttle valve 44 -- it has connected with the exhaust air system which is not illustrated The field which consists of the array of two or more heights is connected to the exhaust air system which is not illustrated through a throttle valve 43. In addition, the adsorption base of this example has the rotation supporters 45, 46, 47, and 48 for positioning a wafer using the orientation flat of a wafer. With the drive piston linked to the air-supply system which is not illustrated, a supporter 48 can be made to be able to open and close and a wafer can be mechanically positioned on an adsorption base.
In addition, the roll off 49 of an adsorption base is a field which enables insertion of the wafer side suction conveyance arm which is not illustrated.
The quality of the material of the adsorption base of invention described above used the wear-resistant good aluminum containing alloy A7075 (Hitachi AHS). However, what has the wafer and coefficient of thermal expansion near as the quality of the material which carry out adsorption fixation is desirable, and it is also possible to use other quality of the materials. For example, it is desirable to produce using a silicon single crystal as an adsorption base for silicon wafers. A square weight-like salient is made using anisotropic etching as how to make the adsorption base made from a silicon single crystal, and the periphery section can be formed using isotropic etching. Such etching technology is well-known in a semiconductor process field. Of course, machining is also possible. If nitride formation processing is performed in the height and the periphery section after processing, rather than a wafer side, a degree of hardness will become high and abrasion resistance will improve.

Next, two or more array pitches for a height are described. The load of the atmospheric pressure is carried out to the wafer side by which vacuum suction is supported and carried out at the nose of cam of a height or the periphery section, and the place where support does not exist bends and deforms. The approximation calculation of the deformation of a wafer can be carried out as an ends supporting beam with which a distributed load is added. They are [width of face / thickness / b and] E and a second moment of area about l and modulus of direct elasticity in h and length. $I = \frac{b\,h^3}{12}$,

If a uniformly distributed load is set to w, it is the amount delta of the maximum deflections of this beam.

$$\delta = \frac{5\,w\,\ell^4}{384\,E\,I} \quad \cdots\cdots (1)$$

It becomes. When width of face b is now assumed to be the pitch of a height, length l is set to diagonal length root2andb in a square array and it is the basis by which 2 (100KPa) joins the unit width of face b the atmospheric pressure of 0.01kg/mm, w is set to 0.01xb and a formula (1) is.

$$\delta = \frac{0.006 \cdot b^4}{E \cdot h^3} \quad \cdots\cdots (2)$$

In the case of a 4 more inch silicon wafer, ** and a formula (2) are delta= 5x10-6 and b4 as E= 2x104kg /and h= 0.4mm mm. .... (3)
Therefore, it is in order to be referred to as delta<=0.001mm.

$$b \leqq \left(\frac{0.001}{5 \times 10^{-6}}\right)^{\frac{1}{4}} = 3.8 \quad \cdots\cdots (4)$$

More, a pitch 4mm or less becomes desirable. since etching processing is performed in order that the rear face of a silicon wafer may remove a polishing post-processing transformation layer, there are many very small crevices, even when area of the point of a height is set to 2 0.0025mm 2-0.01mm, since it is considered to be difficulty that the nose of cam of all heights contacts a wafer side, the array pitch of an actual height expects a margin and 2mm or less is desirable [an array pitch] in addition, in the quality of the material and thickness of a wafer, or the semiconductor field to which detailed-ization of a pattern progresses although it flags and naturally changes by the allowed value of an amount, the amount of deflections of a wafer is smaller than present 1 figure, and a bird clapper requires the distance of this array pitch -- having -- **** -- therefore -- being also alike -- the pitch of a height needs to be alike 2mm or less and to carry out
(It is set to b<=2mm for being referred to as delta<=0.0001mm in (4) formulas)
[Effect of the Invention]
It is effective, when applying to the sample base of the semiconductor process which needs detailed pattern formation, since according to this invention the suction fixation of the wafer can be carried out in the flatness of **0.5 micrometers or less and aggravation of the flatness by the intervention of dust etc. can moreover also be prevented by the supporting point of the letter of a salient for a **** reason.

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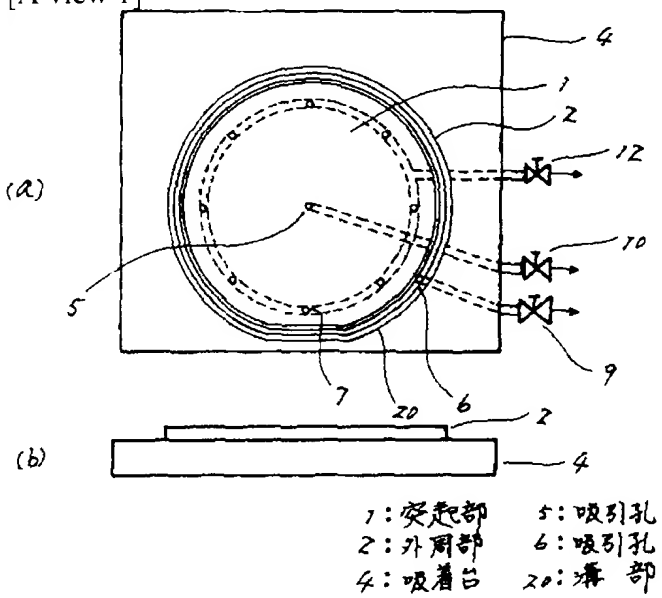
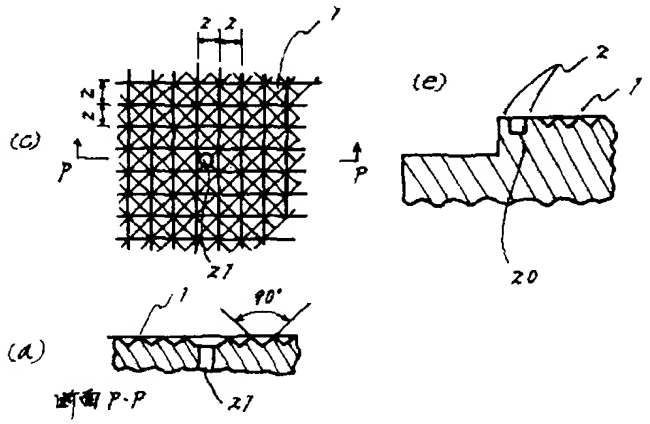
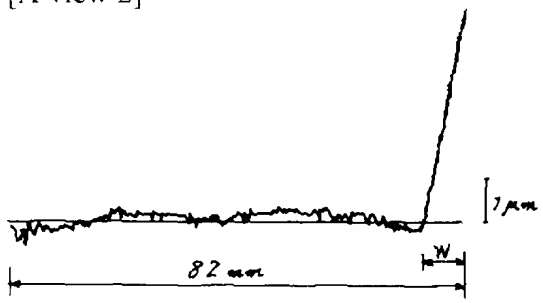
DRAWINGS

[A view 1]

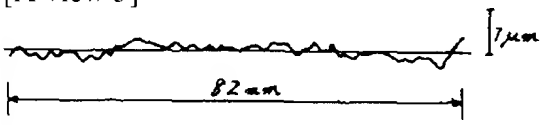




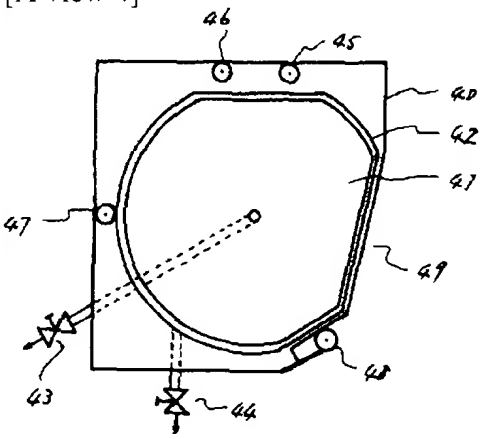
[A view 2]



[A view 3]



[A view 4]



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